PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Bearing Journals

We, KARL SCHMIDT GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, of Christian-Schmidt-Strasse 10, Neckarsulm (Württbg), Germany, a body corporate organised under the Laws of Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a bearing comprising a bearing bush of circular internal cross-section containing a shaft or journal.

In order to achieve high running precision and absence of noise in shafts and journals it has been proposed to use a plain bearing with an oval internal bore. In such a bearing, a running shaft or journal can be very precisely located. Owing to the larger clearances that are available in the surface regions not subjected to load, the oil, which is still thick and viscous for instance when an internal combustion engine starts up from cold, can more readily penetrate into the bearing interior. This property which is useful when the engine starts up from cold nevertheless adversely affects the subsequent running properties of the bearing because the oil becomes thinner when temperatures rise and can therefore more easily run out of the bearing. The result is a drop in the oil pump pressure and increased wear of the parts of the bearing.

In split bearings, the escape of oil is made even more easy because the parting surfaces of the half shells have been dressed off for the removal of burrs. This leaves grooves which provide further opportunities for the oil to run out of the bearing. In the manufacture of plain bearing bushes with sliding surfaces of oval cross-section, special care must therefore be taken to prevent the leakage of lubricant oil. This could be achieved for instance by reducing the ovality of the bearing bush. However, this would in turn necessitate increasing the clearance in the direction of the load because ovality and clearances are closely interrelated in connection with the generation of an oil film in the bearing. By making use of the means hitherto proposed, the employment of oval bearing bushes for very precise running location cannot therefore be combined with a degree of ovality that is best from the point of view of optimum running properties. However, in order to permit oval plain bearing bushes, and principally bearing bushes lacking an electroplated sliding surface, to be used for reliable operation, particularly in internal combustion engines, it has already been proposed to provide the end faces of an oval plain bearing bush with pairs of shells or rings with less oval inner bores than those of the principal running surface of the bearing bush between them. By varying the axial thickness of the shells or rings at each end and their internal diameters, leakage of lubricant oil from the bearing can be controlled or suppressed.

Since an economic production of bearing bushes of oval internal cross-section requires the use of special machines involving correspondingly high costs, preference has already been given, for instance in undivided crankshaft bearings, to the employment of bearing bushes with a completely circular internal cross-section and to the use of shafts or journals of oval cross-section. Unfortunately, when this is done it is impossible to solve the problem of sealing in the same or a similar manner as in the bearing previously described, because in the circumstances contemplated by the present invention a suitably formed lateral sealing disc or ring would have to participate in the rotation of the shaft.

A sealing problem would therefore arise at the end faces of the bearing.

It has been recognised by the present inventers that excessive leakage of lubricant oil from bearing with a circular bore and an

[*Price* 4*s.* 6*d.*]

oval shaft or journal can be controlled by limiting the oval portion of the shaft to within a region that does not extend completely to the ends of the bearing bush and by giving the end portions of the part of the shaft inside the bearing bush a circular or substantially circular cross-section the radius of which is substantially equal to that of the running surface of the bearing bush so as to provide a restricted clearance betweeen the shaft or journal and the bearing bush at the ends of the bearing so as to restrict the flow of oil from the interior of the bearing.

It has been proposed to provide an oil-wedge bearing of the kind in which a space for the lubricating medium between the surfaces which transmit the effective bearing pressure tapers in the direction of rotation so that a wedge-effect is then produced in the supporting oil-film by the frictional drive of the rotating surface, which brings the oil pressure in the film to a high specific pressure. In one such oil-wedge bearing, the oil wedge spaces are formed by several mutually separate recesses distributed over the surface of a shaft journal, said recesses being shorter in the axial direction than the bearing surface of the associated bearing bush. These recesses are formed in such a way that the portion of the shaft bearing then has a non-uniform cross-section throughout its axial length or else the ends of the bearing bush are cut away to enable oil fed to the recesses from the interior of the shaft to flush out the oil in the recesses.

In contradistinction to these bearings, the present invention provides a plain bearing comprising a bearing bush of circular internal cross-section containing a shaft or journal, wherein the shaft or journal has an axially extending portion of uniform non-circular cross-section, the cross-sectional area of which is less than that of portions of the shaft or journal at each end of it, such portion of reduced cross-sectional area being located within the bearing bush but extending uniformly in the axial direction for a distance less than the axial length of the bearing bush, so that, on each side of the portion of reduced cross-sectional area, a part of the portions of the shaft or journal of unreduced cross-sectional area is contained within the bearing bush, so as to provide a restricted clearance between the shaft or journal and the bearing bush at the ends of the bearing bush for restricting the flow of oil from the interior of the bearing.

This arrangement provides a reliable seal for suppressing leakage of oil during operation.

The portions of the shaft or journal of unreduced cross-sectional area may be circular or oval in cross-section, while the portion of reduced cross-sectional area may be oval or trochoidal. In the case where the shaft and the portion of reduced cross-sectional area are both oval in cross-section, the major axes of the oval cross-sections preferably lie in the same axial plane of the shaft or journal.

In order to enable the invention to be more readily understood, reference will now be made to the accompanying drawings, which illustrate diagrammatically and by way of example some embodiments thereof, and in which:—

Fig. 1 is a cross-section of a bearing bush and shaft;

Fig. 2 is a section taken on the line *a—a* in Fig. 1;

Figs. 3, 5 and 7 are cross-sections of various shafts, and

Figs. 4, 6 and 8 are side views of the shafts shown in Figs. 3, 5 and 7.

Referring now to Figs. 1 and 2, there is shown a bearing bush 1 with a circular internal bore for a shaft 20. The shaft 20 has an axially extending portion 2 which is of oval cross-section and of a cross-sectional area less than that of the remainder of the shaft 20 which is of circular cross-section. The axial length of the portion 2 is less than that of the bearing bush 1 so that circular cross-section surfaces of the shaft 20 lie within the bearing bush 1 at each end thereof as shown in Fig. 2 to form a restricted clearance 10 between the shaft and the ends of the bearing bush.

Figs. 3 and 4 show a journal 30 formed with an axially extending portion 3 of trochoidal cross-section the cross sectional area of which is less than that of the remainder of the journal, which is of circular cross-section.

Figs. 5 and 6 show a shaft 40 formed with an axially extending portion 4 of oval cross-section and of less cross-sectional area than the remainder of the shaft which is also of oval cross-section. The major diameters of both oval cross-sections lie in the same axial plan of the shaft.

Figs. 7 and 8 show a journal 50 formed with an axially extending portion 5 of oval cross-section and of less cross-sectional area than the remainder of the journal which is also of oval cross-section. The major diameters of both oval cross-sections are, however, normal to each other.

In each of the embodiments described with reference to Figs. 3 to 8, the length of the axially extending portion 3, 4 or 5 of reduced cross-sectional area is less than that of a bearing bush with which the shaft or journal is to be used so that the surfaces of the portions of the shaft or journal adjacent the portions 3, 4 or 5 lie within the bearing bush at the ends thereof to provide a seal for reducing or controlling the flow of oil from the interior of the bearing.

WHAT WE CLAIM IS:—

1. A plain bearing comprising a bearing bush of circular internal cross-section containing a shaft or journal, wherein the shaft

or journal has an axially extending portion of uniform non-circular cross-section, the cross-sectional area of which is less than that of portions of the shaft or journal at each end of it, such portion of reduced cross-sectional area being located within the bearing bush but not extending uniformly in the axial direction for a distance less than the axial length of the bearing bush, so that, on each side of the portion of reduced cross-sectional area, a part of the portions of the shaft or journal of unreduced cross-sectional area is contained within the bearing bush, so as to provide a restricted clearance between the shaft or journal and the bearing bush at the ends of the bearing bush for restricting the flow of oil from the interior of the bearing.

2. A plain bearing as claimed in Claim 1, wherein the portions of the shaft or journal of unreduced cross-sectional area ar circular in cross-section.

3. A plain bearing as claimed in Claim 1, wherein the portions of the shaft or journal of unreduced cross-sectional area are oval in cross-section.

4. A plain bearing as claimed in any preceding Claim, wherein the portion of the shaft or journal of reduced cross-sectional area is oval in cross-section.

5. A plain bearing as claimed in Claims 3 and 4, wherein the major axes of the oval cross-sections lie in the same axial plane of the shaft or journal.

6. A plain bearing as claimed in Claim 1 or 2, wherein the portion of the shaft or journal of reduced cross-sectional area is trochoidal in cross-section.

7. A plain bearing comprising a bush of circular internal cross-section containing a shaft or journal substantially as hereinbefore described with reference to Figs. 1 and 2, or 3 and 4, or 5 and 6, or 7 and 8 of the accompanying drawings.

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1 SHEET This drawing is a reproduction of the Original on a reduced scale

Fig. 1

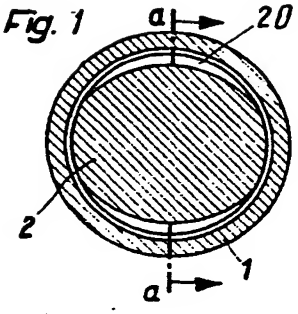

Fig. 2

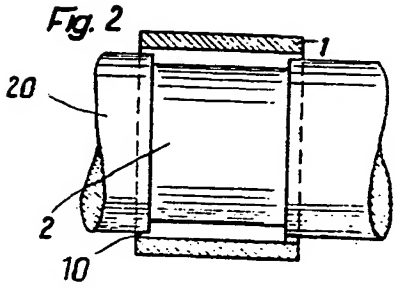

Fig. 3

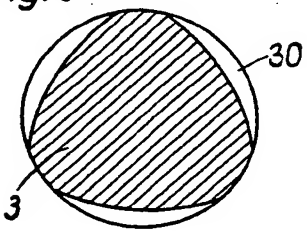

Fig. 4

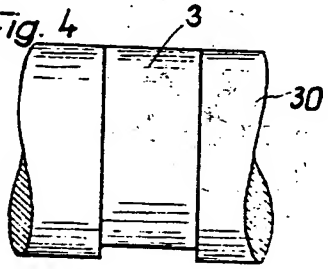

Fig. 5

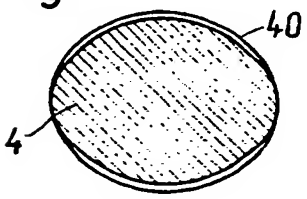

Fig. 6

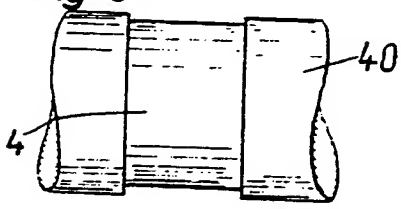

Fig. 7

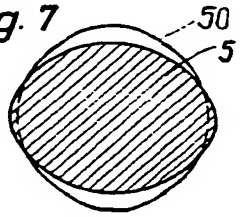

Fig. 8